

TEA2029C

COLOR TV SCANNING AND POWER SUPPLY PROCESSOR

DEFLECTION

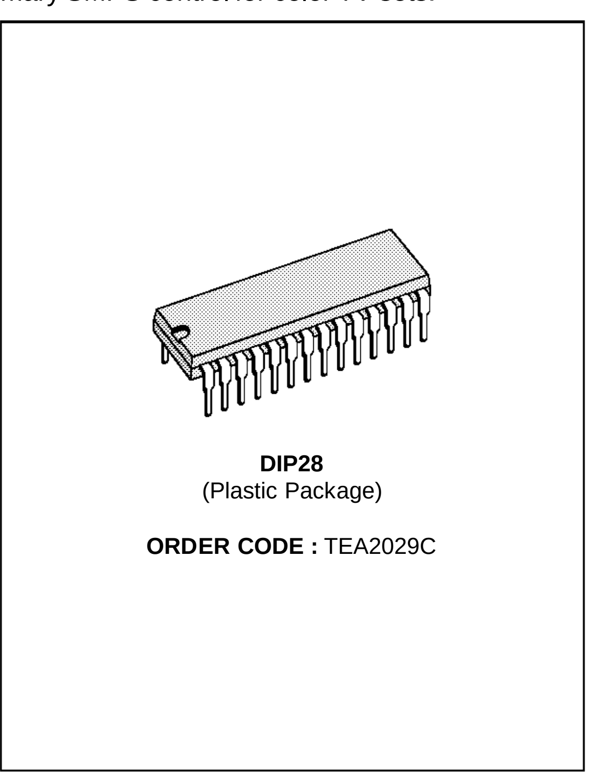
- CERAMIC 500kHz RESONATOR FREQUENCY REFERENCE
- NO LINE AND FRAME OSCILLATOR ADJUSTMENT
- DUAL PLL FOR LINE DEFLECTION
- HIGH PERFORMANCE SYNCHRONIZATION
- SUPER SANDCASTLE OUTPUT
- VIDEO IDENTIFICATION CIRCUIT
- AUTOMATIC 50/60Hz STANDARD IDENTIFICATION
- EXCELLENT INTERLACING CONTROL
- SPECIAL PATENTED FRAME SYNCHRO DEVICE FOR VCR OPERATION
- FRAME SAW-TOOTH GENERATOR
- FRAME PHASE MODULATOR FOR THYRISTOR

SMPS CONTROL

- ERROR AMPLIFIER AND PHASE MODULATOR
- SYNCHRONIZATION WITH HORIZONTAL DEFLECTION
- SECURITY CIRCUIT AND START UP PROCESSOR
- OUTPUT PULSES ARE SENT TO THE PRIMARY SMPS IC (TEA2261) THROUGH A LOW COST TRANSFORMER

DESCRIPTION

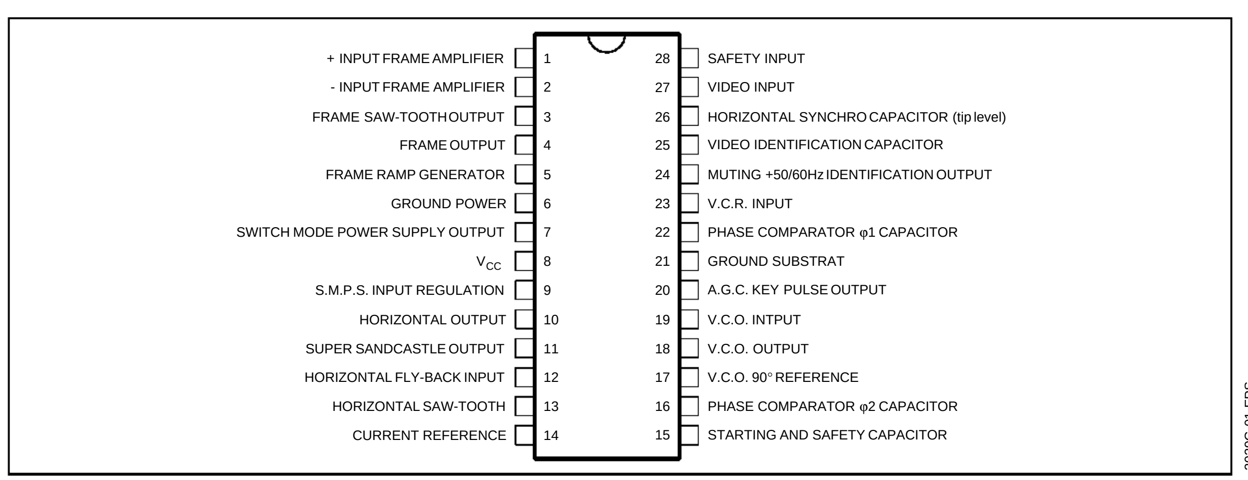
The TEA2029C is a complete (horizontal and vertical) deflection processor with secondary to primary SMPS control for color TV sets.



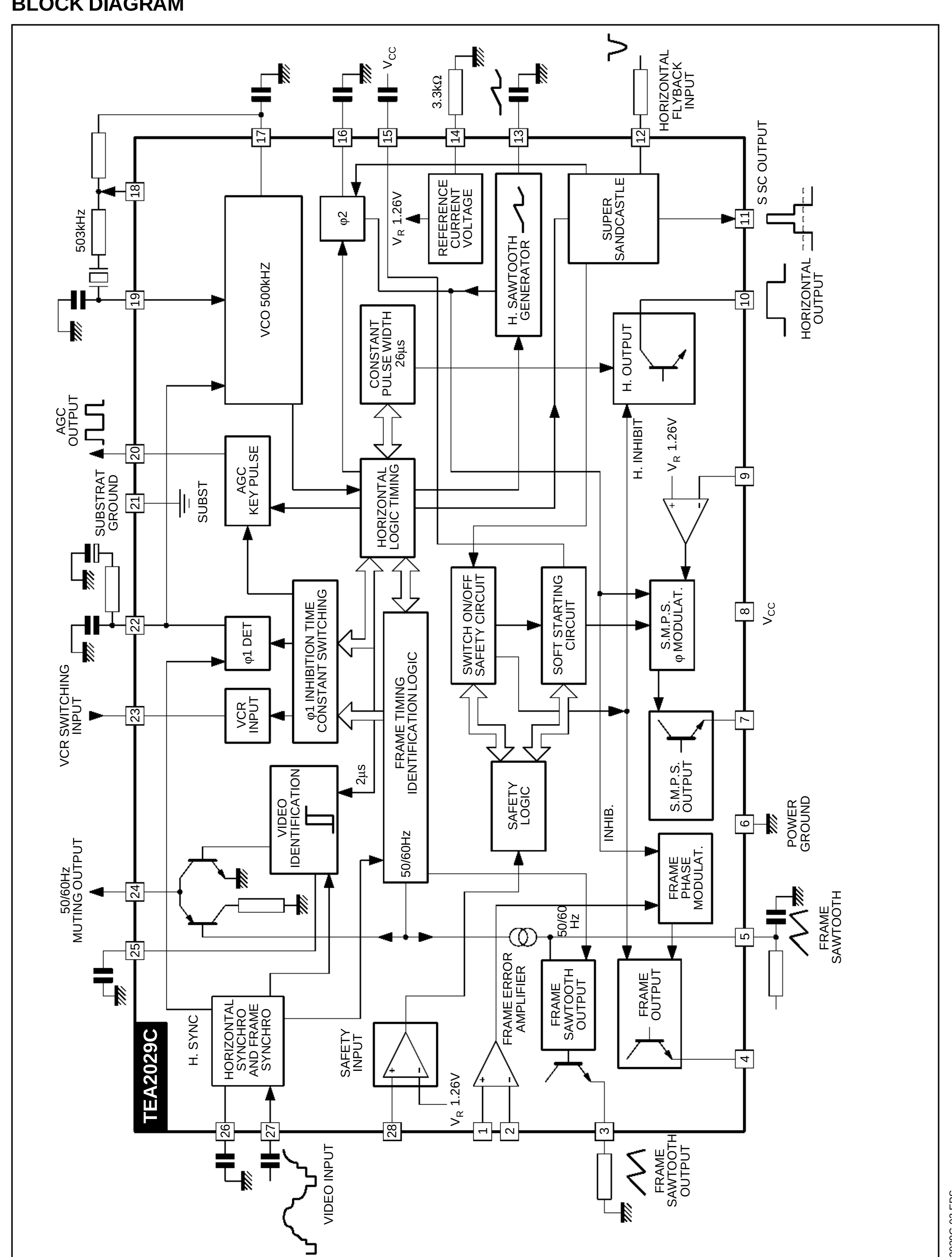
DIP28
(Plastic Package)

ORDER CODE : TEA2029C

PIN CONNECTIONS



BLOCK DIAGRAM



GENERAL DESCRIPTION

This integrated circuit uses I^2L bipolar technology and combines analog signal processing with digital processing.
Timing signals are obtained from a voltage-controlled oscillator (VCO) operating at 500KHz by means of a cheap ceramic resonator. This avoids the frequency adjustment normally required with line and frame oscillators.
A chain of dividers and appropriate logic circuitry produce very accurately defined sampling pulses and the necessary timing signals.

The principal functions implemented are :
- Horizontal scanning processor.
- Frame scanning processor. Two applications are possible :
  - D Class : Power stage using an external thyristor.
  - B Class : Power stage using an external power amplifier with fly-back generator such as the TDA8170.
- Secondary switch mode power regulation. The SMPS output synchronize a primary I.C. (TEA2260/61) at the mains part. This concept allows ACTIVE STANDBY facilities.
- Dual phase-locked loop horizontal scanning.
- High performance frame and line synchronization with interlacing control.
- Video identification circuit.
- Super sandcastle.
- AGC key pulse output.
- Automatic 50-60Hz standard identification.
- VCR input for PLL time constant and frame synchro switching.
- Frame saw-tooth generator and phase modulator.
- Switching mode regulated power supply comprising error amplifier and phase modulator.
- Security circuit and start-up processor.
- 500kHz VCO

The circuit is supplied in a 28 pin DIP case.
V_{CC} = 12V.

Synchronization Separator

Line synchronization separator is clamped to black level of input video signal with synchronization pulse bottom level measurement.
The synchronization pulses are divided centrally between the black level and the synchronization pulse bottom level, to improve performance on video signals in noise conditions.

Frame Synchronization

Frame synchronization is fully integrated (no external capacitor required).
The frame timing identification logic permits automatic adaptation to 50 - 60Hz standards or non-interlaced video.
An automatic synchronization window width system provides :
- fast frame capture (6.7ms wide window),
- good noise immunity (0.4ms narrow window).

The internal generator starts the discharge of the saw-tooth generator capacitor so that it is not disturbed by line fly back effects.
Thanks to the logic control, the beginning of the charge phase does not depend on any disturbing effect of the line fly-back.
A 32µs timing is automatically applied on standardized transmissions, for perfect interlacing.
In VCR mode, the discharge time is controlled by an internal monostable independent of the line frequency and gives a direct frame synchronization.

Horizontal Scanning

The horizontal scanning frequency is obtained from the 500kHz VCO.
The circuit uses two phase-locked loops (PLL) : the first one controls the frequency, the second one controls the relative phase of the synchronization and line fly-back signals.

The frequency PLL has two switched time constants to provide :
- capture with a short time constant,
- good noise immunity after capture with a long time constant.

The output pulse has a constant duration of 26µs, independent of V_{CC} and any delay in switching off the scanning transistor.

Video Identification

The horizontal synchronization signal is sampled by a 2µs pulse within the synchronization pulse. The signal is integrated by an external capacitor.

The identification function provides three different levels :
- 0V : no video identification
- 6V : 60Hz video identification
- 12V : 50Hz video identification

This information may be used for timing research in the case of frequency or voltage synthetizer type receivers, and for audio muting.

Super Sandcastle with 3 levels : burst, line fly-back, frame blanking
In the event of vertical scanning failure, the frame blanking level goes high to protect the tube.
Frame blanking time (start with reset of Frame divider) is 24 lines.

VCR Input

This provides for continuous use of the short time constant of the first phase-locked loop (frequency). In VCR mode, the frame synchronization window

widens out to a search window and there is no delay of frame fly-back (direct synchronization).

Frame Scanning

FRAME SAW-TOOTH GENERATOR. The current to charge the capacitor is automatically switched to 60Hz operation to maintain constant amplitude.

FRAME PHASE MODULATOR (WITH TWO DIFFERENTIAL INPUTS). The output signal is a pulse at the line frequency, pulse width modulated by the voltage at the differential pre-amplifier input.
This signal is used to control a thyristor which provides the scanning current to the yoke. The saw-tooth output is a low impedance, however, and can therefore be used in class B operation with a power amplifier circuit.

Switch Mode Power Supply (SMPS) **Secondary to Primary Regulation**

This power supply uses a differential error amplifier with an internal reference voltage of 1.26V and a phase modulator operating at the line frequency. The power transistor is turned off by the falling edge of the horizontal saw-tooth.
The ”soft start” device imposes a very small conduction angle on starting up, this angle progressively increases to its nominal regulation value.
The maximum conduction angle may be monitored by forcing a voltage on pin 15. This pin may also be used for current limitation.
The output pulse is sent to the primary S.M.P.S. I.C. (TEA2261) via a low cost synchro transformer.

Security Circuit and Start Up Processor

When the security input (pin 28) is at a voltage exceeding 1.26V the three outputs are simultaneously cut off until this voltage drops below the 1.26V threshold again. In this case the switch mode power supply is restarted by the ”soft start” system. If this cycle is repeated three times, the three outputs are cut off definitively. To reset the safety logic circuits, V_{CC} must be zero volt.
This circuit eliminates the risk to switch off the TV receiver in the event of a flash affecting the tube.
On starting up, the horizontal and vertical scanning functions come into operation at V_{CC} = 6V. The power supply then comes into operation progressively.
On shutting down, the three functions are interrupted simultaneously after the first line fly-back.

ABSOLUTE MAXIMUM RATINGS (limiting values) T_{amb} = 25 °C (unless otherwise noted)

Symbol	Parameter	Min.	Max.	Unit
	Supply Voltage (pin 8)		14	V
VCC	Operating Supply Voltage (pin 8)	Starting threshold	13.2	V
I_{20}	AGC Current (pin 20)		5	mA
I_{24}	Video Identification Current (pin 24)		10	mA
V_{12}	Negative Line Retrace Voltage (pin 12)	– 20		V
I_{12}	Line Retrace Current (pin 12)		+ 10	mA
I_{10}	Line Output Current (pin 10)	– 10	40	mA
I_3	Frame Saw-tooth Generator (pin 3)		20	mA
I_4	Frame Output Current (pin 4)		100	mA
I_7	SMPS Output Current (pin 7)	– 40	40	mA
I_{28}	Safety Input Current (pin 28)		5	mA
V_{28}	Safety Input Voltage (pin 28)		V_{CC}	
V_1/V_2	Common Mode Range (pins 1-2)		10	V

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THERMAL DATA

Symbol	Parameter	Value	Unit
$R_{th\ (j-a)}$	Junction-ambient Thermal Resistance	55	°C/W

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ELECTRICAL OPERATING CHARACTERISTICS

T_{amb} = 25°C V_{CC} = 12V (unless otherwise noted) Pulse duration at 50% of the ampl.

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{CC}	Supply Current (pin 8, frame, line and SMPS output without load)		50	80	mA
SYNCH SEPARATOR (Pins 26-27)					
	Positive Video Input AC Coupled (output impedance of signal source < 200Ω)	0.2	1.8	3	V_{pp}
$-I_{27}$	Negative Clamping Current (during synch, pulse)	- 25	- 40	- 55	µA
I_{27}	Clamping Current - Pin for slicing level 0.2V < V_{27pp} < 2V (50% of sync amplitude)	3	6	9	µA

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ELECTRICAL OPERATING CHARACTERISTICS (continued)

Symbol	Parameter	Min.	Typ.	Max.	Unit
SYNCH SEPARATOR (Pins 26-27) (continued)					
$-I_{26}$	Positive Current	0	- 0.75	- 1	nA
I_{26}	Negative Current	17	25	36	µA
PULSE FOR KEYED AGC (Pin 20) - Positive (function : without video signal : low level, with video signal : key pulses)					
I_{20}	Output Current			5	mA
V_{20}	Output Saturation Voltage (I_{20} = 5 mA)		0.25	0.4	V
t_k	Pulse width (synchro pulse is always inside the key pulse)	6.5	8	8.5	µs
VCO (Pins 17-18 and 19)					
	Frequency control range after line divider (ceramic resonator : 503 kHz)	15.30 to 16.10			kHz
PHASE COMPARATOR φ 1 (Pin 22)					
	Output Current Low Loop Gain	± 0.35	± 0.50	± 0.65	mA
	Output Current High Loop Gain	± 1	± 1.5	± 2	mA
	Window Pulse Width	7	10	13	µs
VCR SWITCHING (Pin 23)					
	Threshold Voltage VCR Operating	1.7	2.2	2.7	V
I_{23}	Input Current (V_{23} = 0 V_{CC} = 12V)	- 0.030	- 0.25	- 1	mA
VIDEO IDENTIFICATION (Pin 24)					
V_{24}	Output Saturation Voltage (without video signal, I_{24} = 3 mA)		0.2	0.6	V
	Output Voltage (with 60 Hz video signal, I_{24} = 2.5 mA)	5	6.5	0.6	V
	Output Voltage (with 50 Hz video signal, I_{24} = 10 µA)	11	11.5	7.5	V
VIDEO IDENTIFICATION (Pin 25)					
I_{25}	Output Current (charging the capacitor)	0.5	0.75	1	mA
t_{25}	Identification Time (charging the capacitor)	1.3	1.7	2.2	µs
V_{25}	Threshold (voltage changing from lower to higher value)	4	4.5	5	V
L_{HYS}	Hysteresis	150	240	400	mV
H-RAMP GENERATOR (Pin 13)					
I_{ch13}	Charge Current	185	200	215	µA
V_{l13}	Base Voltage of Saw-tooth			0.5	V
I_{dis13}	Discharge Current	3.5	7		mA
SUPER SANDCASTLE (Pin 11)					
V_{B11}	Burst Key Pulse Level Output Voltage (I_{11} = - 5mA)	9			V
V_{L11}	Line Blanking Pulse Level Output Voltage (I_{11} = - 5mA)	4	4.5	5	V
V_{BT11}	Frame Blanking Pulse Level Output Voltage (and frame out of function) (I_{11} = - 5mA)	2	2.5	3	V
T_{B11}	Delay between Middle of Synch Pulse (pin 27) and Leading Edge of Burst Key Pulse	2.3		3	µs
	Duration of Burst Key Pulse	3.7	4	5	µs
T_{O11}	Delay between SSC Cutting at Pin 12 and Line Blanking Pulse			0.35	µs
NEGATIVE LINE FLY-BACK INPUT (Pin 12)					
	Threshold for SMPS Safety	1.1			V
V_{bl12}	Threshold for Blanking	11	11.5	12	V
$V_{\varphi 12}$	Threshold for PLL2	- 1			V
I_{12}	Input Current 11V < V_{12}			- 200	µA
I_{12}	Input Current 1.3V < V_{12} < 11V	-3		3	µA
I_{12}	Input Current 0V < V_{12} < 1.3V	0		- 80	µA
I_{12}	Input Current - 1V < V_{12} < 0V	0	- 1	- 2	mA
	Line Blanking Trigger			80	µA

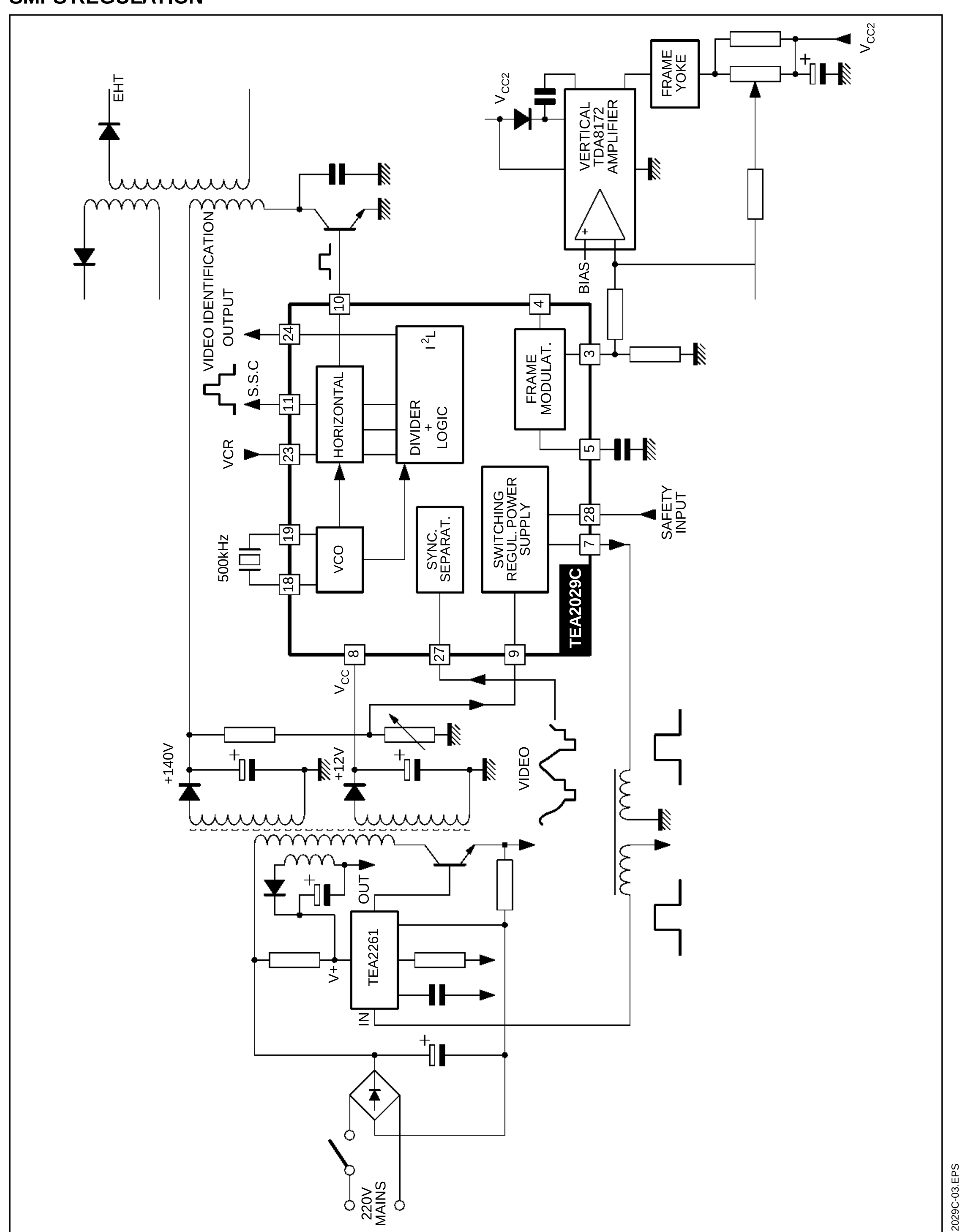
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ELECTRICAL OPERATING CHARACTERISTICS (continued)

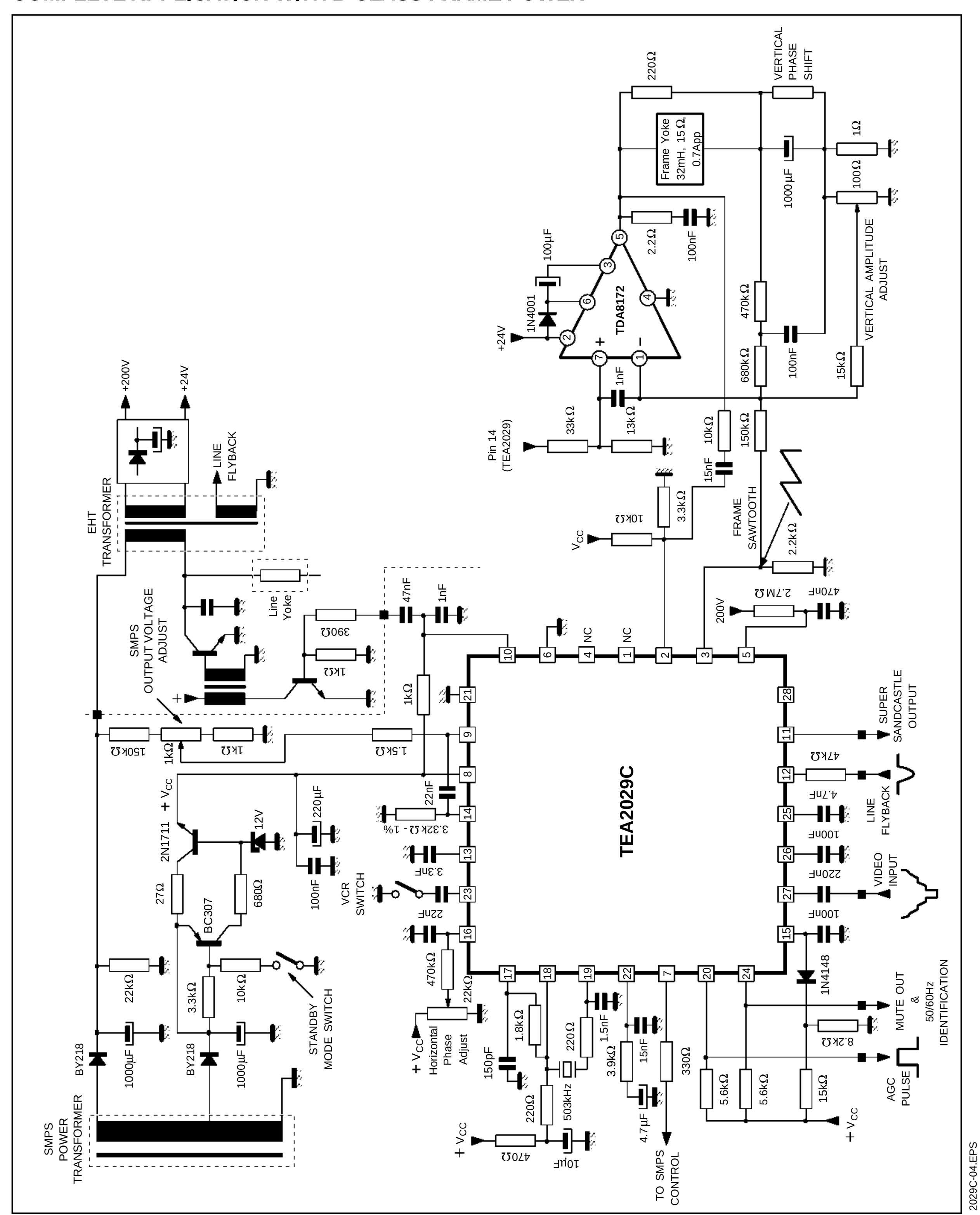
Symbol	Parameter	Min.	Typ.	Max.	Unit
PHASE COMPARATOR φ2 (Pin 16)					
I_{16}	Charging Current	0.4	0.6	0.8	mA
	Delay between the Edges of φ1 and φ2 (f_{VCO} = 500kHz)	1.5	2	2.8	µs
LINE OUTPUT (OPEN COLLECTOR) (Pin 10)					
	Output Voltage (I_{10max} = 20mA)		1	1.5	V
T_{10}	Output Pulse Duration (when fly-back pulse is with in time T_{10}) (f_{VCO} = 500kHz)	24	26	30	µs
Δt	φ2 Phase Range	15	16	19	µs
FRAME LOGIC					
	Free Running Period (with mute signal)		315		Line
	Search Window	247		361	Line
	50Hz Window	309		315	Line
	60Hz Window	247		276	Line
	VCR Mode Window	247		361	Line
FRAME SAW-TOOTH GENERATOR (Pins 3-5)					
	Saw-tooth Amplitude	2	3	4	V_{PP}
I_5(60)	SInternal Current Generator (60Hz on)	12	14	16	µA
	Discharging Time (with C = 0.47µF, ΔV < 4V)	50		70	µs
V_S	Starting Level (0mA < I_S < 0mA)	1	1.26	1.4	V
	Saw-tooth Amplitude (I_S = 10mA)	2	3	4	V_{PP}
FRAME FEEDBACK INPUTS (Pins 1-2)					
$I_{1,2}$	Positive and Negative Input Current (V_1 - V_2) > 25mA for frame blanking safety			10	µA
FRAME OUPUT (Pin 4)					
	Output Voltage (0mA < $\lvert I_4 \rvert$ < 80mA)	10			V
	T_{ON} max (f_{VCO} = 500kHz)	36	40	41	µs
	Output Phase Range	0		$t_{ON\ max}$	
SMPS CONTROL INPUT (Pin 9)					
I_9	Input Current (V_9 = $V_{ref\ 14}$)			2	µA
SMPS OUTPUT (Pin 7) - No Relation between End of SMPS Pulse (pin 7) and Leading Edge of Line Flyback (pin 12)					
V_7	Output Voltage (0 < I_7 < 20mA)	10			V
T_7	$t_{ON\ max}$ (f_{VCO} = 500kHz)	30	32	34	µs
	Nominal Time (V_9 = $V_{ref\ 14}$)	26		31	µs
	Output Phase Range	0		$t_{ON\ max}$	µs
SAFETY INPUT (Pin 28)					
V_{28}	Threshold Voltage (V_{28} = $V_{ref\ 14}$)	1.15	1.26	1.37	V
	Input Current (if V_{28} > $V_{ref\ 14}$ then SMPS, line and frame are switched off during the next line retrace)			3	µA
SWITCH-ON, SWITCH-OFF PROCESSING (Pin 15)					
$I_{ch\ 15}$	Charging Current (t_C = 4µs, T = 64µs)	70		130	µA
$\frac{I_{ch\ 15}}{I_{dis\ 15}}$	Ratio Charging/discharging	0.8	1	1.2	µA
STARTING SUPPLY VOLTAGE (Pin 8)					
V_{CC}	SMPS*, Frame and Line Starting (pins 7, 10 and 4)	5.25		6.5	V
V_{CC}	SMPS Stopping during Line Retrace	5.25		6.5	V
V_{CC}	Frame and Line Stopping	5.25		6.5	V
CURRENT REFERENCE (PIn 14)					
$V_{ref\ 14}$	Voltage Reference	1.2	1.26	1.35	V

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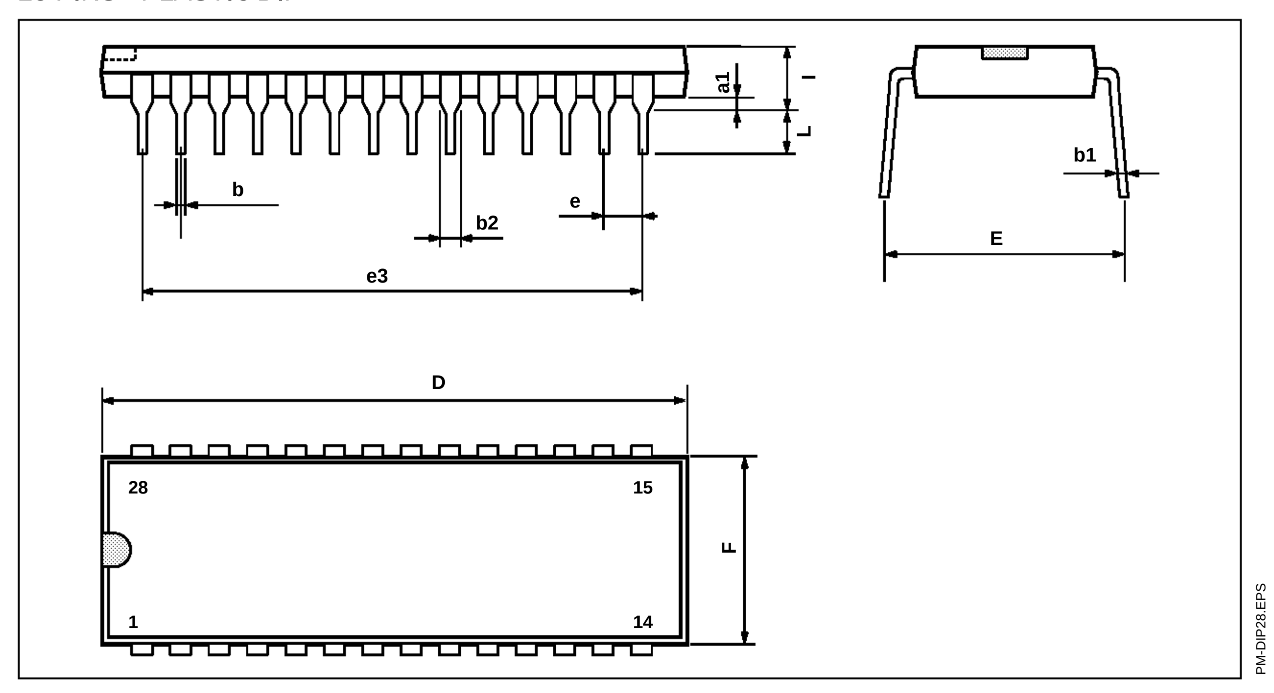
APPLICATION WITH TDA8172 FOR B CLASS FRAME POWER AND TEA2261 FOR SECONDARY SMPS REGULATION



COMPLETE APPLICATION WITH B CLASS FRAME POWER



PACKAGE MECHANICAL DATA
28 PINS - PLASTIC DIP



Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1		0.63			0.025	
b		0.45			0.018	
b1	0.23		0.31	0.009		0.012
b2		1.27			0.050	
D			37.4			1.470
E	15.2		16.68	0.598		0.657
e		2.54			0.100	
e3		33.02			1.300	
F			14.1			0.555
i		4.445			0.175	
L		3.3			0.130	

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